REMARKS

Claims 1-44 are pending in the application (the "Application").

Claims 1-3, 12-14, 23-25 and 34-36 have been rejected.

Claims 4-11, 15-22, 26-33 and 36-44 have been objected to.

No Claims have been amended.

Claims 1-44 remain in the application.

Reconsideration of the claims is respectfully requested.

Amendment to the Specification

Page 14, Lines 10-13, have been amended to correct typographical errors in Equation (6). The expression $\| MFD\ (\vec{A}\ (n-1)\ \|$ in Equation (6) contains an unmatched parenthesis. Similarly, the expression $\| MFD\ (\vec{A}\ (n+1)\ \|$ in Equation (6) also contains an unmatched parenthesis. Equation (6) has been amended to add a matching parenthesis for each expression. No new matter has been added as a result of this amendment.

Allowable Subject Matter

On Page 4 of the March 24, 2005 Office Action, the Examiner stated that Claims 4-11, Claims 15-22, Claims 26-33 and Claims 36-44 were rejected as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations

of the base claim and any intervening claims. The Applicants gratefully acknowledge and agree with the Examiner's determination that the indicated claims contain allowable subject matter.

35 U.S.C. § 103(a) Obviousness

On Pages 2-3 of the March 24, 2005 Office Action, the Examiner rejected Claims 1-2, Claims 12-14, Claims 23-25 and Claims 34-35 under 35 U.S.C. § 103(a) as being unpatentable over United States Patent No. 5,815,596 to Ahuja et al. ("*Ahuja*") in view of United States Patent No. 5,148,501 to Enomoto et al. ("*Enomoto*"). The Applicants respectfully traverse the Examiner's position that the claims in question are unpatentable in view of the *Ahuja* reference and the *Enomoto* reference.

On Pages 3-4 of the March 24, 2005 Office Action, the Examiner rejected Claim 3, Claim 14, Claim 25 and Claim 36 under 35 U.S.C. § 103(a) as being unpatentable over *Ahuja* in view of *Enomoto* and further in view of United States Patent No. 5,646,691 to Yokoyama ("*Yokoyama*"). The Applicants respectfully traverse the Examiner's position that the claims in question are unpatentable in view of the *Ahuja* reference and the *Enomoto* reference and the *Yokoyama* reference.

The Applicants respectfully request the Examiner to withdraw the rejection of Claims 1-3, Claims 12-14, Claims 23-25 and Claims 34-36 in view of the following arguments.

During *ex parte* examinations of patent applications, the Patent Office bears the burden of establishing a *prima facie* case of obviousness. MPEP § 2142; *In re Fritch*, 972 F.2d 1260, 1262, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992). The initial burden of establishing a *prima facie* basis to deny patentability to a claimed invention is always upon the Patent Office. MPEP § 2142; *In re*

Oetiker, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992); *In re Piasecki*, 745 F.2d 1468, 1472, 223 U.S.P.Q. 785, 788 (Fed. Cir. 1984). Only when a *prima facie* case of obviousness is established does the burden shift to the applicant to produce evidence of non-obviousness. MPEP § 2142; *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992); *In re Rijckaert*, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). If the Patent Office does not produce a *prima facie* case of unpatentability, then without more the applicant is entitled to grant of a patent. *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992); *In re Grabiak*, 769 F.2d 729, 733, 226 U.S.P.Q. 870, 873 (Fed. Cir. 1985).

A *prima facie* case of obviousness is established when the teachings of the prior art itself suggest the claimed subject matter to a person of ordinary skill in the art. *In re Bell*, 991 F.2d 781, 783, 26 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1993). To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed invention and the reasonable expectation of success must both be found in the prior art, and not be based on an applicant's disclosure. MPEP § 2142.

For the reasons set forth below the Applicants respectfully submit that the Patent Office has not established a *prima facie* case of obviousness with respect to Claims 1-3, Claims 12-14,

Claims 23-25 and Claims 34-36 of the Applicants' invention.

In rejecting Claims 1-2, 12-14, 23-25 and 34-35 the Examiner stated:

> Regarding apparatus, method, system and computer medium claims 1, 12, 23 and 34 Ahuja discloses,
>
> A boundary detection controller capable of detecting a boundary in vector sequence having arbitrary dimensions by selecting a function to represent a modified first order difference vector or said vector sequence, denoted, wherein said function is dependent upon a frequency characteristic of said vector sequence (note col. 7 lines 44-65, a Gaussian function is selected resulting in spatial frequency).
>
> Wherein said boundary controller is capable of operating upon said modified first order difference vector with a length operator to obtain a scalar value (computes scalar quantity not[e] col. 13 line 29) that represents a value of a change in said vector sequence at point n and detecting a local maximum of said scalar value (note col. 13 lines 29-32, scalar value has a local maximum and vector change is used to examine boundary); and
>
> However, Ahuja does not disclose determining whether said local maximum of said scalar value is larger than a predetermined threshold value. Enomoto discloses that comparing value to a predetermined value corrects estimated values (note col. 6 lines 30-60). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention was made to determine if said scalar value is larger than a predetermined threshold value. Correcting values would have been a highly desirable feature in edge analysis art due to its processing function and Enomoto recognizes that correcting value would be expected when determining if said scalar value is larger than a predetermined threshold value is applied to Ahuja.
>
> Regarding apparatus, method, system and computer medium claims 2, 13, 25 and 35 Ahuja and Enomoto discloses,
>
> Selecting point n as an edge point when said local maximum of said scalar value is larger than said predetermined threshold value (note Enomoto col. 2 lines 55-66). (March 24, 2005 Office Action, Pages 2-3).

The Applicants respectfully traverse the conclusions of the Examiner concerning the alleged teachings of the *Ahuja* reference and the *Enomoto* reference. The Applicants respectfully direct the Examiner's attention to the unique and novel elements of Claim 1 of the Applicants' invention.

> 1. (Original) An apparatus for detecting a boundary in a vector sequence representing a signal, said apparatus comprising:

a boundary detection controller capable of detecting a boundary in a vector sequence $\vec{A}(n)$ having an arbitrary dimension by

selecting a function to represent a modified first order difference vector of said vector sequence $\vec{A}(n)$, denoted $MFD(\vec{A}(n))$, wherein said function is dependent upon a frequency characteristic of said vector sequence $\vec{A}(n)$;

wherein said boundary detection controller is capable of operating upon said modified first order difference vector $MFD(\vec{A}(n))$ with a length operator to obtain a scalar value $\left\| MFD(\vec{A}(n)) \right\|$ that represents a value of a change in said vector sequence $\vec{A}(n)$ at point n and detecting a local maximum of said scalar value $\left\| MFD(\vec{A}(n)) \right\|$; and

wherein said boundary detection controller is capable of determining whether said local maximum of said scalar value $\left\| MFD(\vec{A}(n)) \right\|$ is larger than a predetermined threshold value. (Emphasis added).

The Applicants respectfully point out that the unique and novel elements of Claim 1 are not obvious in view of the teachings of the *Ahuja* reference. The method of *Ahuja* requires the use of two parameters to calculate a "force vector" (i.e., a magnitude and a direction) for each point in an image. "A first step is to select two parameters for the affinity force vector determination." (*Ahuja*, Column 5, Lines 5-7). The first parameter is a "spatial scale parameter" (denoted σ_s) that measures a "cut off" distance from a first point to a second point. The second parameter is a "contrast scale parameter" (denoted σ_g) that measures homogeneity between a first point and a second point.

The *Ahuja* method must first determine the values for these two parameters. "Because the region structure is not yet known, the spatial scale parameters must either be known, estimated, or automatically determined . . . . " (*Ahuja*, Column 5, Lines 23-25). "Like the spatial scale parameter, the contrast scale parameter may be determined by either automatic determination, estimation, or

prior knowledge." (*Ahuja*, Column 5, Lines 43-45).

The *Ahuja* method then determines an "affinity force vector" that represents each point's affinity to every other point in the image. Each "affinity force vector" comprises "a magnitude and a direction" (*Ahuja*, Claim 1). The *Ahuja* method determines region boundaries by making a plot of the affinity force vectors and by locating affinity force vectors whose directions are opposite to each other (Ahuja, Claim 2). This shows that the *Ahuja* method for finding boundaries relies on observing and comparing the "direction" of a first "affinity force vector" with a "direction" of a second "affinity force vector." That is, the "directions" (and not "magnitudes") of two affinity force vectors must be compared.

This is because the force function of *Ahuja* at a regional boundary becomes discontinuous. (*Ahuja*, Column 7, Lines 65-67). "Therefore, regional discontinuities are easily detected because the force vector at each point along the boundary is indeterminate. Thus, region boundary detection may be performed either manually by observing a plot of the force vectors or automatically by observing the points of discontinuity in the image for the particular scale." (*Ahuja*, Column 7, Line 67 to Column 8, Line 5) (Emphasis added).

The *Ahuja* method relies on observing and comparing the plotted "directions" of two affinity force vectors. Unlike the Applicants' invention the *Ahuja* method (1) does not use a function that represents a modified first order difference vector, and (2) does not use a "length operator" to obtain a "scalar value" that represents a value of a change in a vector sequence $\vec{A}(n)$, and (3) does not detect a local maximum of the "scalar value."

The functions used by *Ahuja* do not represent a modified first order difference vector of the type disclosed and claimed by the Applicants. The *Ahuja* functions (whether Gaussian functions, exponential functions, linear functions or pulse functions) represent a force function (with components of both "magnitude" and "direction") that is a function of "distance between P and Q" and a function of the difference between "the gray levels of P and Q." (*Ahuja*, Column 7, Lines 29-43).

The portion of the *Ahuja* reference that was cited by the Examiner that refers to the use of a scalar quantity does not refer to the detection of region boundaries. (*Ahuja*, Column 13, Lines 14-32). The cited text begins "In addition to determining region boundaries, the present invention also determines information about the shape of the structure." The "region skeleton" that is referred to is described as a central axis of a region. That is, the "region skeleton" is not located at a region boundary. The text states that "as one moves away from region boundary towards the interior, there is a curve across which the force changes direction, from facing one side of the region boundary to facing the other. This curve represents an estimate of the region skeleton . . . . " (*Ahuja*, Column 13, Lines 20-24) (Emphasis added). The location of the "region skeleton" is supposedly detected by noting when the "direction" of the force vector stops pointing to a first side of the region and begins pointing to a second side of the region. This occurs in the middle of the region and not near a region boundary.

The *Ahuja* reference also supposes that the "region skeleton" may also be identified by modifying the equation of the affinity force vector by dropping the "direction" term $\hat{r}_{pq}$ in order to

compute a scalar quantity. (*Ahuja*, Column 13, Lines 26-29). The dropping of the "direction" term from the equation of the affinity force vector is not equivalent to applying a length operator to obtain a scalar value.

The *Ahuja* reference further asserts that the resulting distribution of scalar values will have a local maximum at the region skeleton. (*Ahuja*, Column 13, Lines 29-30). The Applicants respectfully submit that this assertion of the *Ahuja* reference is incorrect and the method that is suggested is inoperative with respect to the *Ahuja* method. Consider, for example, a region that has a completely homogeneous image (i.e., all of the pixels in the region have the same color values). The *Ahuja* method states that the force vector must have a Null Interior Response. That is, the magnitude of the force vector is zero in a completely homogeneous image. (*Ahuja*, Column 6, Lines 61-62). If the magnitude of the force vector is zero everywhere within the interior of the region, then there cannot be a local maximum at the region skeleton. *Ahuja* has asserted without any explanation or demonstration that there would be a "distribution of scalar values" and that this supposed "distribution of scalar values" would have a "local maximum" at the region skeleton. The Applicants respectfully submit that this supposed teaching of *Ahuja* is not enabled and in inoperative with respect to the main teachings of the *Ahuja* reference. In any event, a method for detecting a region skeleton in the middle of a region (and not near a region boundary) does not teach, suggest or even hint at the detection of a region boundary.

For the reasons set forth above, the Applicants respectfully submit that the Applicants' invention as set forth in Claim 1 is not obvious in view of the *Ahuja* reference. The Applicants

respectfully submit that the deficiencies of the *Ahuja* reference that have been identified cannot be remedied by either the *Enomoto* reference or the *Yokoyama* reference.

The Applicants agree that the *Ahuja* reference does not disclose the use of not disclose the step of determining whether a local maximum of a scalar value is larger than a predetermined threshold value. The Applicants respectfully traverse the Examiner's assertion that it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the *Ahuja* method to include a step of comparing a scalar value is to a predetermined threshold value as taught by *Enomoto*.

The supposed motivation in the statement that "Correcting values would have been a highly desirable feature in edge analysis art due to its processing function and Enomoto recognizes that correcting value would be expected when determining if said scalar value is larger than a predetermined threshold value" is very general and does not specifically suggest combining the teachings of the *Ahuja* reference with the teachings of the *Enomoto* reference. There must be some suggestion or motivation, either in the references themselves, or in the knowledge generally available to one of ordinary skill in the art, to modify a reference or to combine reference teachings. The desire to "correct values" is too general and vague to provide the requisite motivation to modify a reference or to combine reference teachings.

Even if the *Ahuja* reference could somehow be combined with the *Enomoto* reference, the combination would not teach, suggest, or even hint at the Applicants' invention as set forth in Claim 1. MPEP § 2142 indicates that a prior art reference (or references when two or more

references are combined) must teach or suggest all the claim limitations of the invention. The teaching or suggestion to make the claimed invention and the reasonable expectation of success must both be found in the prior art, and not be based on an applicant's disclosure. In the present case, the *Ahuja* reference and the *Enomoto* reference in combination would not teach or suggest all the claim limitations of the Applicants' invention. Therefore, the Applicants respectfully submit that the rejection of Claim 1 under 35 U.S.C. § 103(a) has been overcome.

The Applicants note that Claim 2 depends directly or indirectly from Claim 1. As previously described, Claim 1 contains unique and novel claim limitations of the Applicants' invention. Therefore, Claim 2 also contains the same unique and novel claim limitations of Claim 1 and is therefore patentable over the *Ahuja* reference and the *Enomoto* reference, either separately or in combination. The combination of the *Ahuja* reference and the *Enomoto* reference do not disclose, suggest or even hint at the concept of determining a local maximum of a scalar value for a modified first order difference vector.

The Examiner also rejected Claim 3 under 35 U.S.C. § 103(a) as being unpatentable over a combination of the *Ahuja* reference and the *Enomoto* reference and the *Yokoyama* reference. The Applicants respectfully traverse this assertion of the Examiner. The supposed motivation in the statement that "Correcting initial point allocation would have been highly desirable feature in the contour analysis art due to its processing function and Yokoyama recognizes that correcting initial point allocation would be expected when Euclidean distance is computed in the system of Ahuja and Enomoto" is very general and does not specifically suggest combining the teachings of the

Yokoyama reference with the *Ahuja* reference and with the teachings of the *Enomoto* reference. There must be some suggestion or motivation, either in the references themselves, or in the knowledge generally available to one of ordinary skill in the art, to modify a reference or to combine reference teachings. The desire to "correct initial point allocation" is too general and vague to provide the requisite motivation to modify a reference or to combine reference teachings.

Even if the *Yokoyama* reference could somehow be combined with the *Ahuja* reference and with the *Enomoto* reference, the combination would not teach, suggest, or even hint at the Applicants' invention as set forth in Claim 3. MPEP § 2142 indicates that a prior art reference (or references when two or more references are combined) must teach or suggest all the claim limitations of the invention. The teaching or suggestion to make the claimed invention and the reasonable expectation of success must both be found in the prior art, and not be based on an applicant's disclosure. In the present case, the *Yokoyama* reference and the *Ahuja* reference and the *Enomoto* reference in combination would not teach or suggest all the claim limitations of the Applicants' invention. Therefore, the Applicants respectfully submit that the rejection of Claim 3 under 35 U.S.C. § 103(a) has been overcome.

The Examiner also rejected Claims 12-14, Claims 23-25 and Claims 34-36 under 35 U.S.C. § 103(a) for the same reasons that the Examiner rejected Claims 1-3.

The Applicants note that Claim 12, Claim 23 and Claim 34 each contain unique and novel claim elements that are analogous to the unique and novel claim elements of Claim 1. As previously described, Claim 1 contains unique and novel claim limitations of the Applicants'

invention. Therefore, because Claim 12, Claim 23 and Claim 34 also contain the same unique and novel claim limitations of Claim 1 they are therefore patentable over the *Ahuja* reference and the *Enomoto* reference and the *Yokoyama* reference, either separately or in combination.

The Applicants note that Claim 13 and Claim 14 depend from Claim 12. As previously described, Claim 12 contains unique and novel claim limitations of the Applicants' invention. Therefore, Claim 13 and Claim 14 also each contain the same unique and novel claim limitations of Claim 12 and are therefore patentable over the *Ahuja* reference and the *Enomoto* reference and the *Yokoyama* reference, either separately or in combination.

The Applicants note that Claim 24 and Claim 25 depend from Claim 23. As previously described, Claim 23 contains unique and novel claim limitations of the Applicants' invention. Therefore, Claim 24 and Claim 25 also each contain the same unique and novel claim limitations of Claim 23 and are therefore patentable over the *Ahuja* reference and the *Enomoto* reference and the *Yokoyama* reference, either separately or in combination.

The Applicants note that Claim 35 and Claim 36 depend from Claim 34. As previously described, Claim 34 contains unique and novel claim limitations of the Applicants' invention. Therefore, Claim 35 and Claim 36 also each contain the same unique and novel claim limitations of Claim 34 and are therefore patentable over the *Ahuja* reference and the *Enomoto* reference and the *Yokoyama* reference, either separately or in combination.

The Applicants respectfully submit that Claims 1-44 are in condition for allowance. Allowance of Claims 1-44 is respectfully requested.

The Applicants' attorney has made the amendments and arguments set forth above in order to place this Application in condition for allowance. In the alternative, the Applicants' attorney has made the amendments and arguments to properly frame the issues for appeal. In this Amendment, the Applicants make no admission concerning any now moot rejection or objection, and affirmatively deny any position, statement or averment of the Examiner that was not specifically addressed herein.

SUMMARY

For the reasons given above, the Applicants respectfully request reconsideration and allowance of pending claims and that this Application be passed to issue. If any outstanding issues remain, or if the Examiner has any further suggestions for expediting allowance of this Application, the Applicants respectfully invite the Examiner to contact the undersigned at the telephone number indicated below or at ***wmunck@davismunck.com***.

The Commissioner is hereby authorized to charge any additional fees connected with this communication or credit any overpayment to Deposit Account No. 50-0208.

Respectfully submitted,

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Date: July 25, 2005

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